

# NUMBER SENSE

## DAY 1

# OVERVIEW OF COURSE

- ◉ PA Common Core Content Standards
- ◉ Standards of Mathematical Practice
- ◉ What is number sense
- ◉ How do we develop number sense

# AGENDA

- ◉ Professional Norms
- ◉ Standards for Mathematical Practice
- ◉ What Is Number Sense?
- ◉ Read and Discuss “Components of Number Sense”
- ◉ Base-five Activity
- ◉ How Do You Develop Number Sense?
- ◉ Quick Images
- ◉ Quick Images Video
- ◉ Planning

# WORKING TOGETHER

- Take a minute and think about what would make this a risk-free learning environment.

# STANDARDS FOR MATHEMATICAL PRACTICE

Take time to read the Standards for Mathematical Practice.

- ◉ What is something that stood out/interested you? Something you have a question about?
- ◉ As a table group, discuss: To what extent do you think these practices are embedded in the daily work of teachers and students?

# WHAT IS NUMBER SENSE?

- Take a few minutes to jot down a few thoughts about what number sense is. Fill in the left side of your sheet.

I think number sense is ...	But now I know it is . . .

# NUMBER SENSE IS...

- ◎ The National Council of Teachers (USA, 1989) identified five components that characterize number sense: number meaning, number relationships, number magnitude, operations involving numbers and referents for numbers and quantities. These skills are considered important because they contribute to general intuitions about numbers and lay the foundation for more advanced skills.

# NUMBER SENSE IS ...

Number sense refers to a person's general understanding of number and operations along with the ability to use this understanding in flexible ways to make mathematical judgments and to develop useful strategies for solving complex problems (Burton, 1993; Reys, 1991).



○ How are the  
Standards for  
Mathematical  
Practice connected to  
developing number  
sense?

○ How and where do the PA  
CC Math and CCSSM  
standards address the  
topic of number sense?

# STUDENTS WHO STRUGGLE IN MATH OFTEN LACK NUMBER SENSE.

**They find it difficult to**

- ▶ **Compute**
- ▶ **Find relationships among numbers or equations**
- ▶ **Figure out problems involving geometry, measurement, and data**

# TEACHING NUMBER SENSE

- Read the article  
“Components of Number Sense.”

# COUNTING: THE BASIS FOR NUMBER SENSE

**Students must know:**

- ▶ The sequence of number names, both starting at 1 and not starting at 1
- ▶ How to count a set, keeping track of the items they counted
- ▶ Skip counting from 1 and from other numbers
- ▶ Cardinality
- ▶ Conservation
- ▶ 1-to-1 correspondence
- ▶ Making tens - link to understanding place value
- ▶ Subitizing

# COUNTING FROM A STUDENT'S PERSPECTIVE

- Consider counting in a system that uses only the symbols 0, 1, 2, 3, and 4. For any number larger than 4, you need to use the next place to represent one group of five. That is, in this place value system, five is used as the base instead of ten.

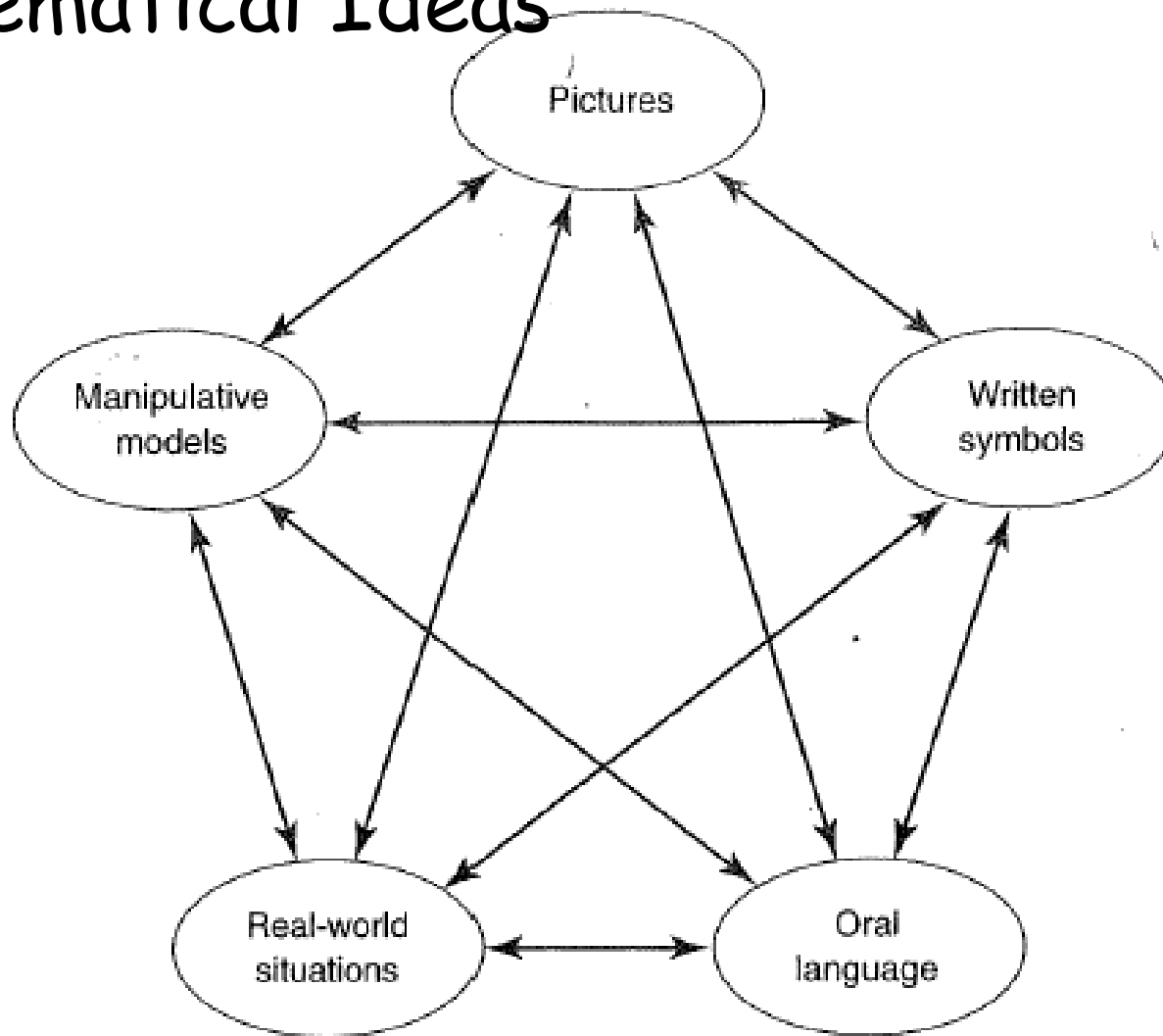
# COUNTING FROM A STUDENT'S PERSPECTIVE

- Tools to help you.....



- What might these represent?

# Different Representations of Mathematical Ideas





# REFLECTING





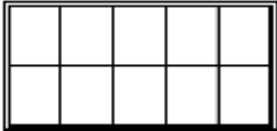
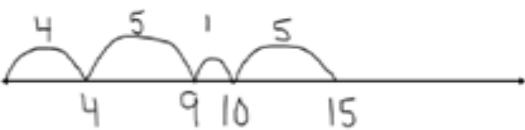
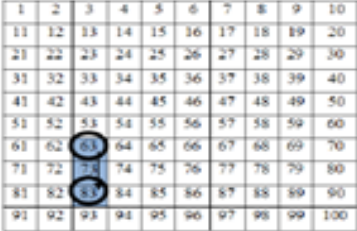
- ◉ As you were engaging in this activity, what things did you notice?
- ◉ Which Standard(s) for Mathematical Practice where you most engaged in during the base 5 activity?
- ◉ CC.2.1.K.A.21 Know number names and write and recite the count sequence.
- ◉ CC.2.2.1.A.1 Represent and solve problems involving addition and subtraction within 20.

- Look at your I think I knew but now I know chart, and think about what students who have number sense would be able to do based on what you know number sense is.

# STUDENTS WITH NUMBER SENSE . . .

- ◉ Naturally decompose numbers
- ◉ Can visualize quantities
- ◉ Develop and use benchmarks as referents
- ◉ Use the relationships among operations and their knowledge of the base-ten number system to solve problems
- ◉ Estimate a reasonable result for a problem
- ◉ Have a disposition to make sense of numbers, problems, and results

# MODELS AND TOOLS:

Dot images	
<u>Rekenreks</u>	 
Five- and ten-frames	 
Number line	Solving $4 + 5 + 6$ 
Hundred chart	<div data-bbox="620 1115 861 1208" style="border: 1px solid black; padding: 5px; display: inline-block;"><math>63 + 10 = 73</math> <math>73 + 10 = 83</math></div> 

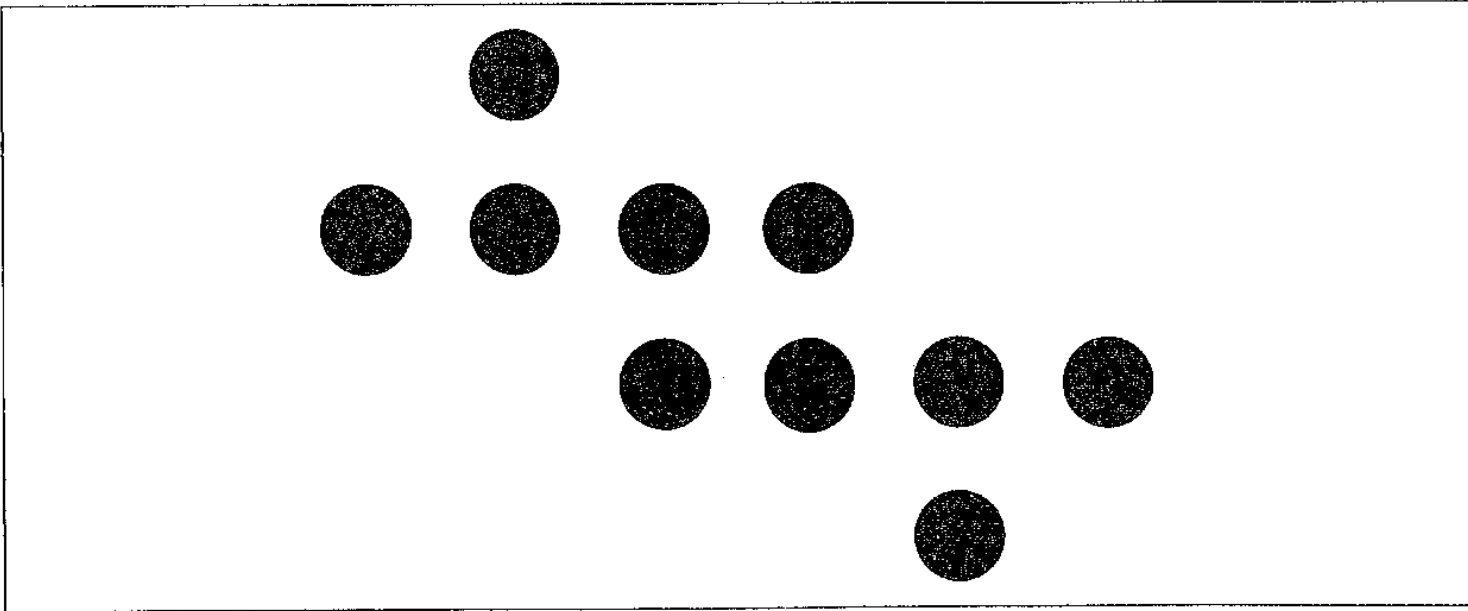
# *DEVELOPING NUMBER SENSE: VISUALS*

- ◉ Develop students' understanding of a quantity
- ◉ Give numbers meaning
- ◉ Help students see the relationships of numbers to one another
- ◉ Helps students move from perceptual to conceptual subitizing
  - Children who can subitize perform better in mathematics in the long run (Butterworth).
- ◉ Support understanding of how numbers operate

# QUICK IMAGES

- ◉ Use a variety of models and visual arrangements
- ◉ Have students construct image, especially at first, and discuss their strategy
- ◉ Allows students to see math ideas within a mixture of formats
- ◉ Helps students think flexibly and encourages deep understanding fo subitizing
- ◉ Show the images in a related order

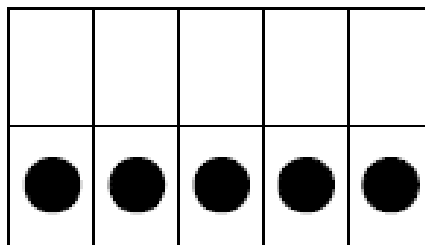
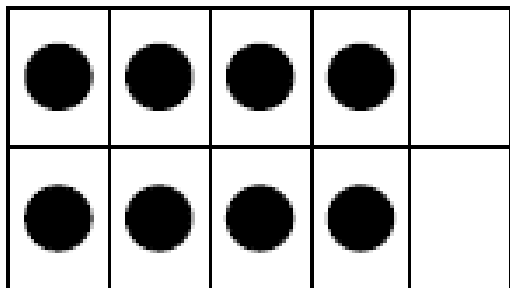
# DOT CARDS



Highlights arrangements of quantities

# TEN FRAMES

- ◉ Highlight use of 5- and 10-structures of our number system
- ◉ Frame shows quantity's relationship to 10
- ◉ Helps compose and decompose 10

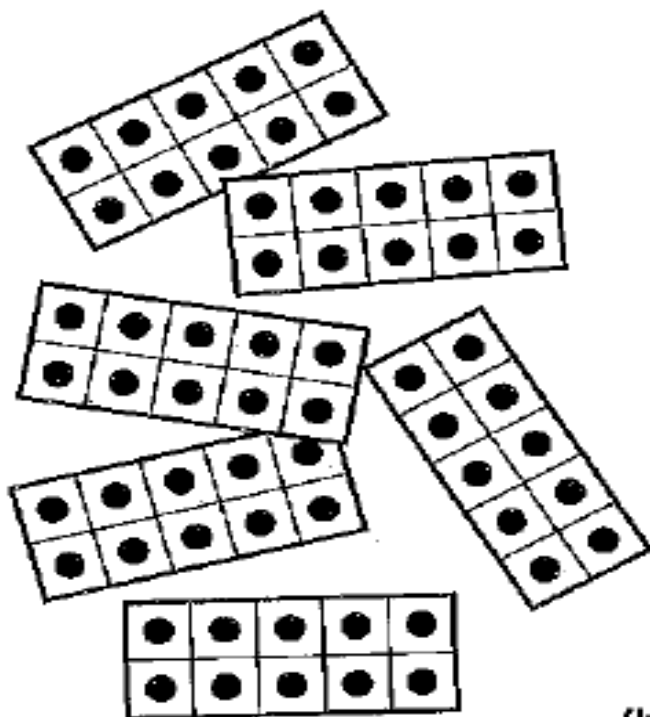




# EXTENDING TEN FRAME THINKING



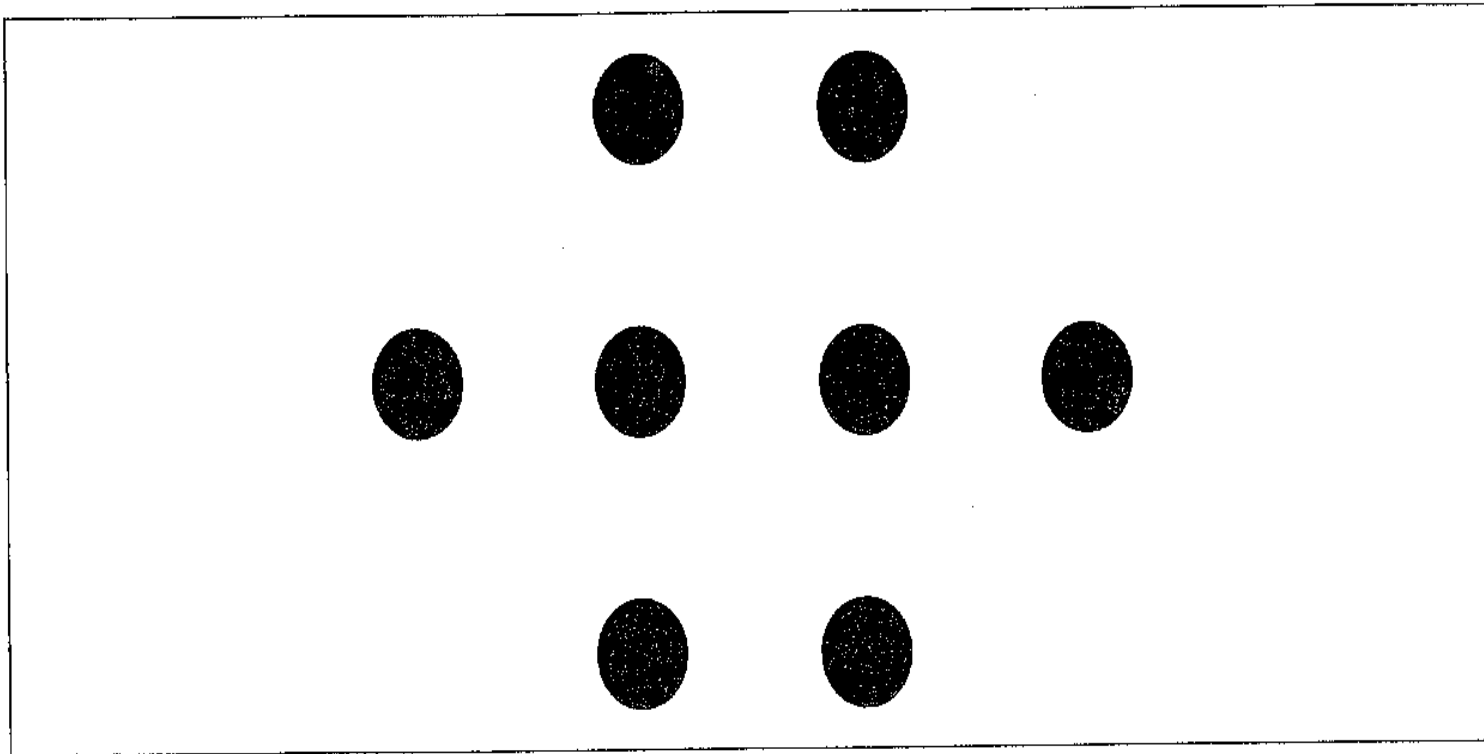
8 and 5 more:  
2 from 5 to get to 10  
and 3 more is 13.



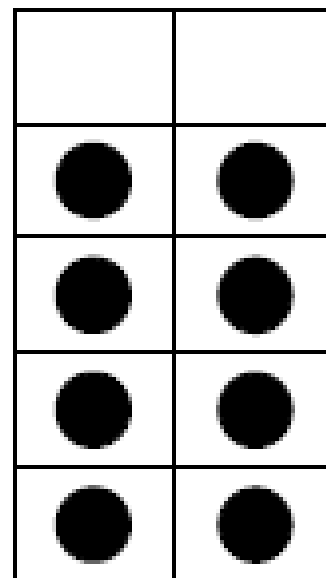
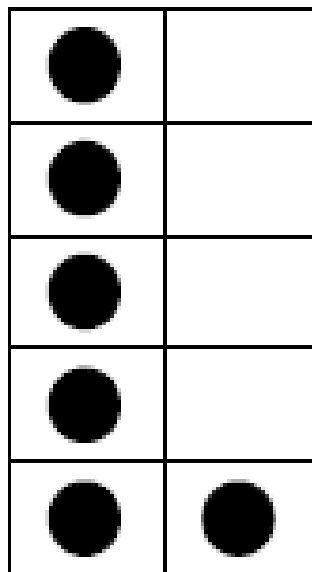
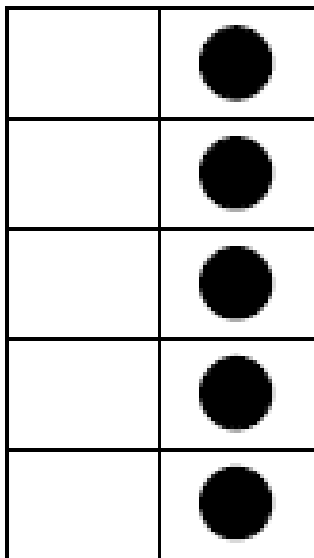
So ...  
68 and 5:  
2 more to  
get to 70  
and 3 is 73.



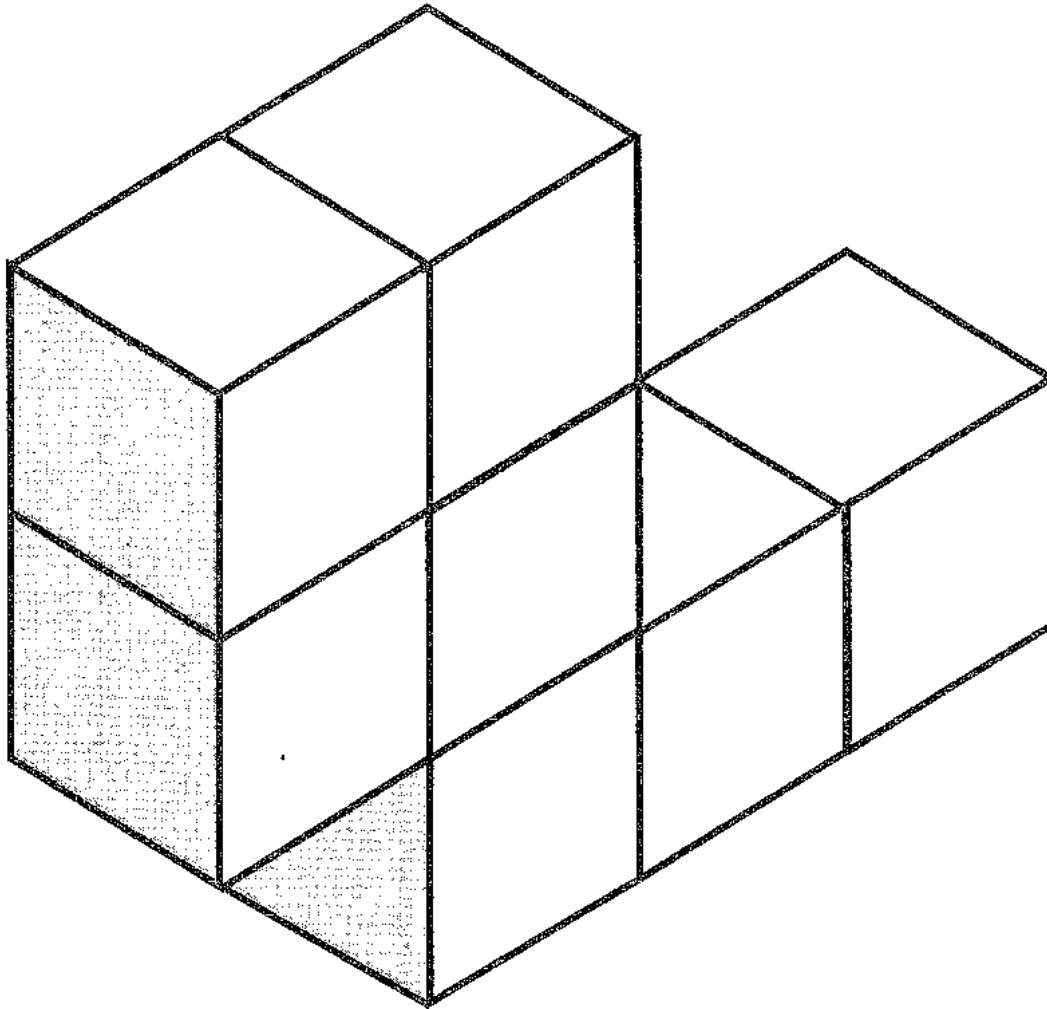
# DOT CARDS



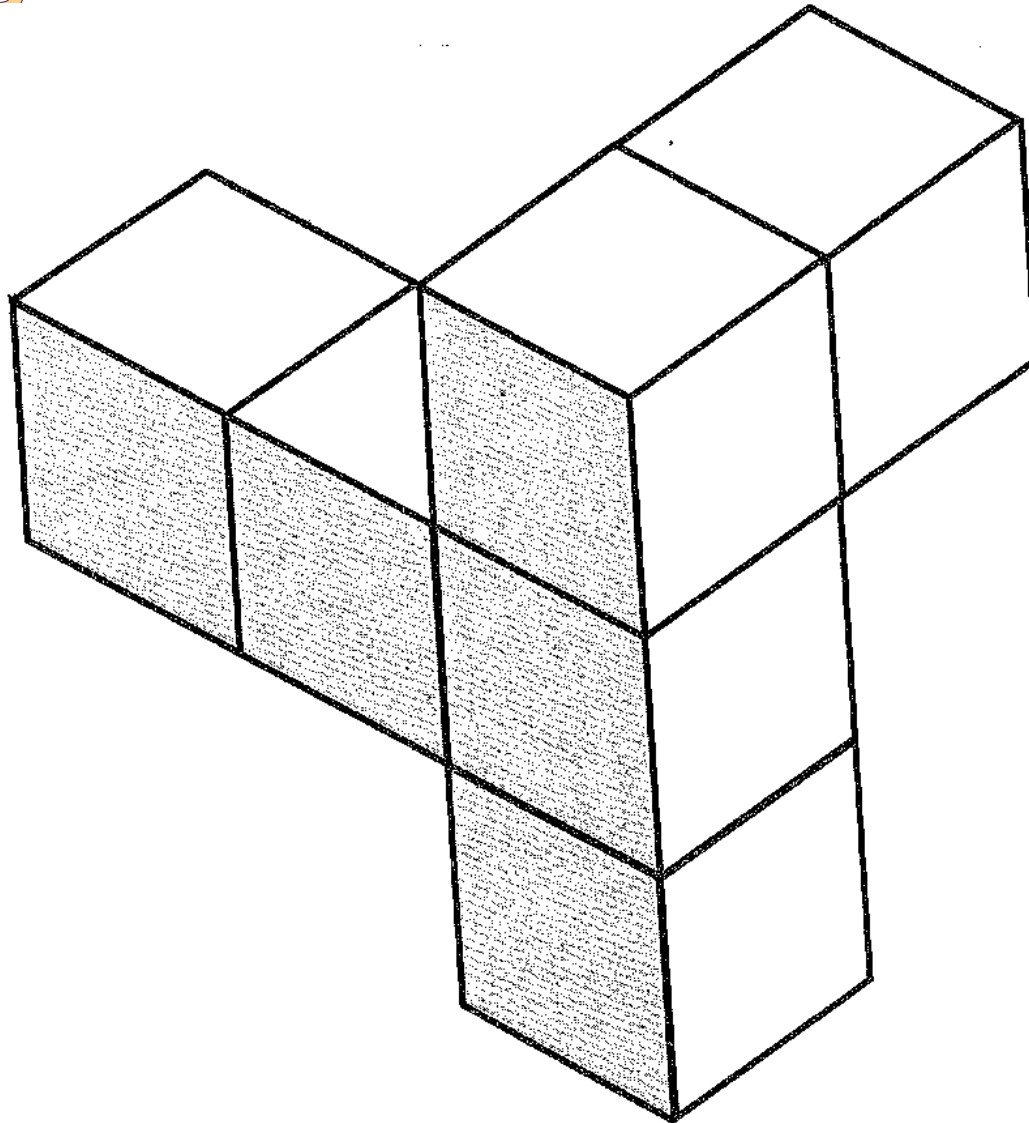
# TEN FRAMES



# CUBES



# CUBES



# PICTURE



# SIMILARITIES & DIFFERENCES

- Think about the dots, the ten-frame, and the cubes. Which was most difficult to recreate? Why?
- Which was easiest?

# QUICK IMAGES VIDEO

- Take note of how each student remembered and constructed the quick image figure.



## QUICK IMAGES VIDEO

- ◉ Did you see any evidence that students were using number sense?
- ◉ Did any of the students using subitizing?

# STRATEGIES TO BUILD NUMBER SENSE

- ◉ Model different methods for computing.
- ◉ Ask students regularly to calculate mentally.
- ◉ Have class discussions about strategies for computing.
- ◉ Make estimation an integral part of computing.
- ◉ Question students about how they reason numerically.
- ◉ Pose numerical problems that have more than one possible answer.
- ◉ Pose real-life problems.
- ◉ Have students use visual models.

# NUMBER SENSE IN YOUR CLASSROOM

- Plan task/activity focusing on one standard and one standard for math practice involving the use of visuals to develop/extend number sense.

